

WHAT IS CLAIMED IS:

1. An energy irradiation apparatus comprising an insertion portion which includes a hollow cylindrical member having a sealed distal end portion and is inserted into a living body, and an energy irradiation mechanism which is placed inside the hollow cylindrical member and radiates energy to living tissue through an irradiation window portion which is provided on a side wall of the hollow cylindrical member to extend in a longitudinal direction, wherein
said energy irradiation mechanism comprises an energy irradiation end portion which is placed facing the irradiation window portion and reciprocating along the longitudinal direction of the irradiation window portion, and
a driving unit which drives said energy irradiation end portion to make reciprocating motion with substantially a constant velocity.
2. The apparatus according to claim 1, wherein
said energy irradiation end portion comprises a mirror placed facing a light exit surface of an optical fiber for energy transmission, and
a guide comprises an angle changing mechanism which changes a light exit angle of said mirror with respect to an opening portion upon the reciprocal movement to make said mirror reflect energy output from the light exit of the optical fiber and direct the

energy to a deep portion of living tissue.

3. The apparatus according to claim 2, wherein power of reciprocating motion with substantially a constant velocity by said driving unit is transmitted through
5 the optical fiber.

4. The apparatus according to claim 3, wherein
said insertion portion incorporating said energy
irradiation mechanism and said guide and said driving
unit are configured to be separated from each other,
10 and

15 said insertion portion is configured to be
detachable from said driving unit by engaging a locked
member fixed to a midway portion of the optical fiber
with a lock portion of a power transmission member of
said driving unit.

5. The apparatus according to claim 1, wherein said
driving unit comprises a motor which rotates at a
constant velocity, and a power transmission portion
which sets a ratio of a time for direction change of
20 the reciprocating motion with substantially a constant
velocity to a time for one reciprocating motion to not
more than 35%.

6. The apparatus according to claim 1, wherein a
ratio of a interval of motion with a constant velocity
25 to a stroke of reciprocating motion is more than 70%.

7. The apparatus according to claim 5, wherein the
power transmission portion comprises a heart cam

mechanism portion.

8. The apparatus according to claim 5, wherein the power transmission portion comprises a crank mechanism portion including a plurality of elliptic gears which
5 are rotatably and axially supported.

9. The apparatus according to claim 5, wherein the power transmission portion comprises an intermittent gear which has a sector gear formed on an outer surface and is rotatably and pivotally supported, and an
10 endless belt which includes a teeth portion which meshes with the sector gear of said intermittent gear and is formed on an inner surface of the endless belt and is linearly guided.

10. The apparatus according to claim 5, wherein the
15 power transmission portion comprises a first conversion portion which converts the uniform rotating motion from said motor into uniform swinging motion, and a second conversion portion which converts the converted uniform swinging motion into uniform linear motion.

20 11. The apparatus according to claim 10, wherein said first conversion portion includes a roller gear cam mechanical portion, and said second conversion portion includes a flexible member which is wound around a pulley fixed to a shaft member which rotatably and
25 axially supports a disk having a roller which meshes with a gear of said roller gear cam mechanical portion and is linearly guided.

12. The apparatus according to claim 1, wherein the energy includes a laser beam.
13. The apparatus according to claim 1, wherein said motor comprises a linear motor.
- 5 14. The apparatus according to claim 1, wherein said energy irradiation end portion comprises an ultrasonic radiator.
15. An energy irradiation apparatus comprising an insertion portion which includes a hollow cylindrical member having a sealed distal end portion and is inserted into a living body, and an energy irradiation mechanism which is placed inside the hollow cylindrical member and radiates energy to living tissue through an irradiation window portion which is provided on a side wall of the hollow cylindrical member to extend in a longitudinal direction, wherein
said energy irradiation mechanism comprises an energy irradiation end portion which is placed facing the irradiation window portion and reciprocating along the longitudinal direction of the irradiation window portion,
a transmitting member which transmits a reciprocation in a major axis direction of said insertion portion to cause said energy irradiation end portion to make reciprocating motion,
a cylinder which is held to be rotatable about an axis parallel to an axis in the longitudinal direction

and has a shaped portion which is formed on an outer surface and reciprocates said transmitting member, and a driving unit including a motor which rotates said cylinder.

- 5 16. The apparatus according to claim 15, wherein the shaped portion of said cylinder reciprocates said transmitting member at substantially a constant velocity, and sets a ratio of a time for direction change to a time for one reciprocating motion to not
10 more than 35%.
17. The apparatus according to claim 14, wherein a ratio of a interval of motion with a constant velocity to a stroke of reciprocating motion is more than 70%.
18. The apparatus according to claim 15, wherein said
15 cylinder comprises a hat-like member which is directly coupled to an output shaft of said motor and can incorporate said motor.
19. The apparatus according to claim 15, wherein the shaped portion comprises an endless groove which is
20 continuously formed on the outer surface of said cylinder, and causes said transmitting member to make the reciprocation by causing said transmitting member to follow said endless groove.
20. The apparatus according to claim 19, wherein said
25 endless groove causes said transmitting member to make one reciprocation or two reciprocations per rotation of said cylinder.

21. The apparatus according to claim 15, wherein
said energy irradiation end portion comprises a
mirror placed facing a light exit of an optical fiber
for energy transmission, and

5 a guide comprises an angle changing mechanism
which changes a light exit angle of said mirror with
respect to the irradiation window portion upon the
reciprocal movement to make the mirror reflect energy
output from the light exit of the optical fiber and
10 direct the energy to a deep portion of living tissue.

22. The apparatus according to claim 21, wherein said
transmitting member is fiber.

23. The apparatus according to claim 19, wherein
said insertion portion incorporating said energy
15 irradiation mechanism and said guide and said driving
unit are configured to be separated from each other,
and

 said insertion portion is configured to be
detachable from said driving unit by engaging a locked
20 member fixed to the transmitting member with the
endless groove of said cylinder.

24. The apparatus according to claim 15, wherein the
energy comprises a laser beam.

25. The apparatus according to claim 15, wherein said
25 energy irradiation end portion comprises an ultrasonic
radiator.